4 Alignment and Adjustments

This section of the service manual explains how to make permanent adjustments to the monitor. Directions are given for adjustments using the monitor Interface Board Ver. 2.0 and software (Softjig).

4-1 Adjustment Conditions

Caution: Changes made without the Softjig are saved only to the user mode settings. As such, the settings are not permanently stored and may be inadvertently deleted by the user.

4-1-1 Before Making Adjustments

4-1-1 (a) ORIENTATION

When servicing, always face the monitor to the east.

4-1-1 (b) MAGNETIC FIELDS

Whenever possible, use magnetic field isolation equipment such as a Helmholtz field to surround the monitor. If a Helmholtz field is not available, frequently degauss the unit under test.

Caution: Other electrical equipment may cause external magnetic fields which may interfere with monitor performance.

Use an external degaussing coil to limit magnetic build up on the monitor. If an external degaussing coil is not available, use the internal degaussing circuit. However, do not use the internal degaussing circuit more than once per 30 minutes.

4-1-1 (c) WARM-UP TIME

The monitor must be on for 30 minutes before starting alignment. Warm-up time is especially critical in color temperature and white balance adjustments.

4-1-1 (d) SIGNAL

Analog, 0.7 Vp-p positive at 75 ohm, internal termination
Sync: Separate
(TTL level negative / positive)

4-1-1 (e) SCANNING FREQUENCY

Horizontal : 30 kHz to 85 kHz (Automatic)
Vertical : 50 Hz to 160 Hz (Automatic)

Unless otherwise specified, adjust at the 1024 x 768 mode (68 kHz / 85 Hz),
Refer to Table 2-1 on page 2-3.

4-1-2 Required Equipment

The following equipment may be necessary for adjustment procedures:

4-1-2 (a) DISPLAY CONTROL ADJUSTMENT

1. Non-metallic (–) screwdriver: 1.5, 2.5, 3 mm
2. Non-metallic (+) screwdriver: 1.5, 2.5, 3 mm
3. Digital Multimeter (DMM), or Digital Voltmeter
4. Signal generator, or DM200 software
5. Software: Softjig or DM200
6. Interface Board Ver. 2.0 Code No. BH81-90001K
7. Parallel communications cable (25-pin to 25-pin); Code No. BH81-90001H
8. Signal cable (15-pin to 15-pin cable with additional 3-pin connector); Code No. BH81-90001J
9. 5 V DC adapter, not supplied
10. Personal computer

Note: Softjig Ass'y (includes items 6, 7 and 9) Code No. BH81-90001L

4-1-2 (b) COLOR ADJUSTMENTS

1. All equipment listed in 4-1-2 (a), above
2. Color analyzer, or any luminance measurement equipment

4-1-3 Connecting the SoftJig

Connect the monitor to the signal generator and / or PC as illustrated in Figures 4-1 and 4-2.

Note: The signal cable connector which includes the 3-wire cable must connect to the monitor. If you use Setup 2 (PC only, no signal generator) you can only make adjustments to the signal timing available on that computer system. To make corrections to all factory timings requires the use of an additional signal generator.

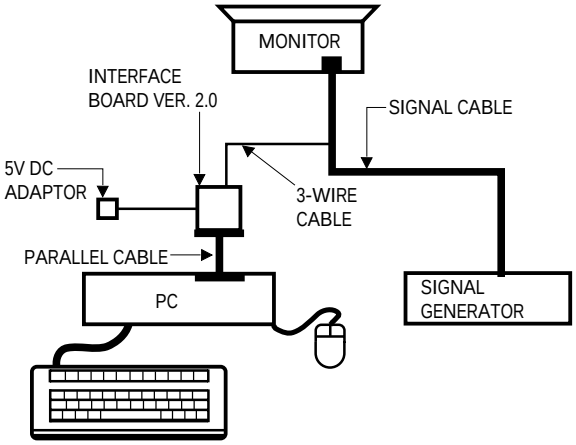

Figure 4-1. Setup 1, With Signal Generator

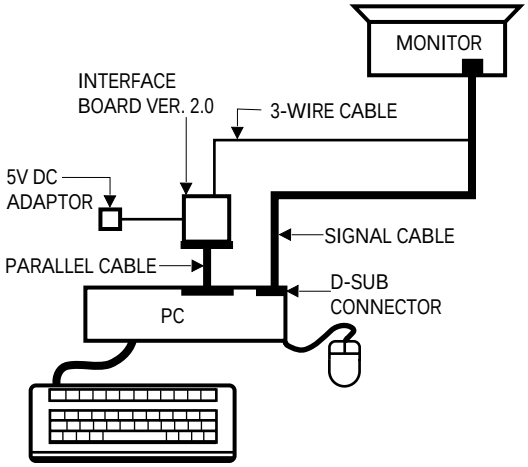

Figure 4-2. Setup 2, Without Signal Generator

4-2 Display Control Adjustments

4-2-1 HIGH VOLTAGE ADJUSTMENT

Signal: 1024 x 768 (68 kHz/85 Hz)
Display image: Don't care
Contrast: Minimum
Brightness: Minimum
Limit: 26.0 kV ± 0.3 kV

Measure the hight voltage level at the anode cap. High voltage should be within the limit as above. If the high voltage needs adjustment use the following procedure.

PROCEDURE

1. Turn the power off and disconnect the AC line cord from the power source.
2. Turn the power on after connecting high voltage Probe.
3. Using the jig, adjust the high voltage to the specification.

* High Voltage Adjustment PROCEDURE using Softjig

① Select matching model name in "Model" field.

② Select " @7: Zero Beam" in menu after selecting "Extra 1"

③ Adjust high voltage using control bar after selecting "HV MIN"

④ Turn the power off/on after adjustment finished.

⑤ Check the high voltage has been fixed with adjusted value after reselecting "@7: Zero Beam".

4-2-2 SCREEN VOLTAGE ADJUSTMENT

CONDITIONS

Signal: 1024 x 768 (68 kHz/85 Hz)
Display image: Don't care
Contrast: Minimum
Brightness: Minimum
Limit: 520 V ± 10 V

Screen Voltage adjustment procedure using softjig is all the same as 4-2-1 but selecting "G2 CONT" on the contrary to "HV MIN".

4-2-3 CENTER RASTER

Adjust SW401 so that the back raster comes to the center when you apply basic mode for 17".

4-2-4 Centering

Centering means to position the center point of the display in the middle of the display area. Horizontal size and position and vertical size and position control the centering of the display.

Adjust the horizontal size and vertical size to their optimal settings: 312 mm (H) x 234 mm (V).

Adjust the horizontal position and vertical position to ≤ 4.0 mm of the center point of the screen.

|A-B| ≤ 4.0 mm. |C-D| ≤ 4.0 mm.

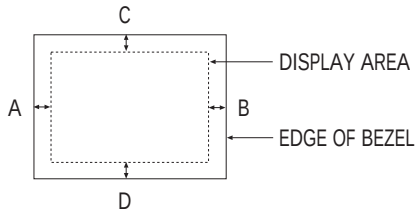

Figure 4-3. Centering

* In Softjig window, "Geometry" has to be selected for GD adjustment.

4-2-4 (a) HORIZONTAL SIZE ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz/85 Hz
Display image: Crosshatch pattern
Brightness: Maximum
Contrast: Maximum

Use control bar after selecting "H-SIZE" in left menu to adjust the horizontal size of the display pattern to 312 mm.(Tolerance: ± 3 mm.)

If "H-SIZE" is not enough to adjust it, select "SIZE B+" by turns.

4-2-4 (b) VERTICAL SIZE ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz/85 Hz
Display image: Crosshatch pattern
Brightness: Maximum
Contrast: Maximum

Use control bar after selecting **"V-SIZE"** in left menu to adjust the vertical size of the display pattern to 234 mm.(Tolerance: ± 3 mm.)

4-2-4 (c) HORIZONTAL POSITION ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
Display image: Crosshatch pattern

Use control bar after selecting **"H-POSITION"** in left menu to center the horizontal image on the raster.

4-2-4 (d) VERTICAL POSITION ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
Display image: Crosshatch pattern

Use control bar after selecting **"V-POSITION"** in left menu to center the vertical image on the raster.

4-2-5 Linearity

Linearity affects the symmetry of images as they appear on the screen. Unless each row or column of blocks in a crosshatch pattern is of equal size, or within the tolerances shown in Table 4-1 , an image appears distorted, elongated or squashed.

$$\text{Horizontal Linearity} = 2x\frac{\text{X max-X min}}{\text{X max+X min}}\ x100$$

$$\text{Vertical Linearity} = 2x\frac{\text{Y max-Y min}}{\text{Y max+Y min}}\ x100$$

Table 4-1.

	Adjacent Linearity	Entire Linearity
Preset mode	≤ 4%	≤ 10%
Pre-load mode	≤ 5%	≤ 14%

4-2-5 (a) HORIZONTAL LINEARITY ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
Display image: Crosshatch pattern
Brightness: Maximum
Contrast: Maximum

To adjust the Horizontal Linearity, refer to Tables 4-2 and 4-3 for the tolerance range.

Increase or decrease **H_LIN** to optimize the image.

4-2-5 (b) VERTICAL LINEARITY ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
Display image: Crosshatch pattern
Brightness: Maximum
Contrast: Maximum

To adjust the Vertical Linearity, refer to Tables 4-2 and 4-3 for the tolerance range.

Use control bar after selecting **"V-LINEARITY BAL"** in left menu to optimize the image.

4-2-6 Trapezoid Adjustment

CONDITIONS

Scanning frequency: 68 kHz / 85 Hz
Display image: Crosshatch pattern
Brightness: Maximum
Contrast: Maximum

Use control bar after selecting **"TRAPEZOID"** in left menu to make the image area rectangular.

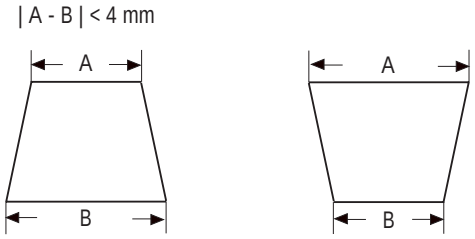

Figure 4-4. Trapezoid

4-2-7 Pinbalance Adjustment

CONDITIONS

Scanning frequency:	68 kHz / 85 Hz
Display image:	Crosshatch pattern
Brightness:	Maximum
Contrast:	Maximum

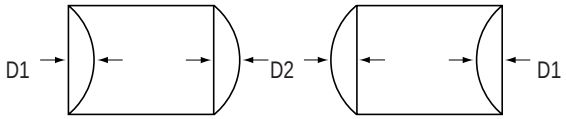

Figure 4-5. Pinbalance

Use control bar after selecting **"PINBALANCE"** in left menu to optimize the image.

4-2-8 Parallelogram Adjustment

CONDITIONS

Scanning Frequency:	68 kHz / 85 Hz
Display image:	Crosshatch pattern
Brightness:	Maximum
Contrast:	Maximum

Use control bar after selecting **"PARALLEL"** in left menu to make the image area rectangular.

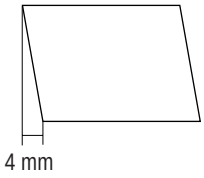

Figure 4-6. Parallelogram

4-2-9 Side Pincushion Adjustment

CONDITIONS

Scanning frequency:	68 kHz / 85 Hz
Display image:	Crosshatch pattern

Use control bar after selecting **"PINCUSHION"** in left menu to straighten the sides of the image area.

$|C1|, |C2| \leq 2.0$ mm, $|D1|, |D2| \leq 2.0$ mm.

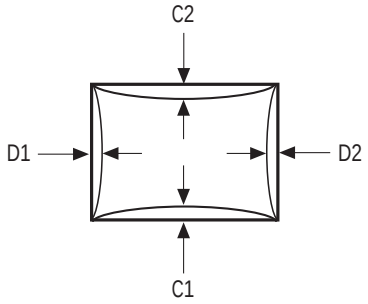

Figure 4-7. Pincushion

4-2-10 Tilt Adjustment

CONDITIONS

Scanning Frequency:	68 kHz / 85 Hz
Display image:	Crosshatch pattern
Brightness:	Maximum
Contrast:	Maximum

Use control bar after selecting **"ROTATION"** in left menu to correct the tilt of the display.

4-2-11 Degauss

No adjustments are available for the degaussing circuit. The degaussing circuit can effectively function only once per 30 minutes.

4-2-12 To Delete the User Mode Data

To delete the adjustment data from the user modes, click **"@4: USER DELETE"** in right ment**.**

4-2-13 Save the Data

To save the adjustment data for a mode, press **"@3: ALL MODE SAVE"** in right ment**.**

4-3 Color Adjustments

CAUTION:Check below condition before color adjustment
Video signal : Analog 0.7 Vp-p (at 75 Ω)
Sync : TTL level (H, V seperate signal)

* Select “Color” in Softjig menu for color adjustment.

4-3-1 Color Coordinates (Temperature)

Color temperature is a measurement of the radiant energy transmitted by a color. For computer monitors, the color temperature refers to the radiant energy transmitted by white. Color coordinates are the X and Y coordinates on the chromaticity diagram of wavelengths for the visible spectrum.

CONDITIONS

Measurement instrument: Color analyzer
Scanning frequency: 68 kHz/85 Hz
Display image: White flat field at center of display area
Luminance: Maximum

PROCEDURE

Use the directions in sections 4-3-2 through 4-3-3 to adjust the color coordinates for:
9300K to x = 0.283 ± 0.02, y = 0.298 ± 0.02
6500K to x = 0.313 ± 0.02, y = 0.329 ± 0.02

4-3-2 Color Adjustments for 9300K

4-3-2 (a) BACK RASTER COLOR ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz/85 Hz
Display image: Back raster pattern
Brightness: Maximum
Contrast: Maximum

1. Select **“@1: CHANNEL 1”** in right menu to control the color for 9300K.
2. Adjust the luminance of the back raster to between 0.5 to 0.7 ft-L using contron bar after selecting **“GREEN CUTOFF”** in the menu.
3. Use control bar after selecting **“BLUE CUTOFF”** in left menu to set the “y” coordinate to 0.298 ± 0.02.
4. Use control bar after selecting **“RED CUTOFF”** in left menu to 0.283 ± 0.02.

* If color values would not be matched desirable values, repeat sequence 3 and 4 after readjusting “GREEN CUTOFF” control a little different.

4-3-2 (b) WHITE BALANCE ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz/85 Hz
Display image: White box pattern
Brightness: 0.06ft-L at Back Raster Pattern Display
Contrast: Maximum

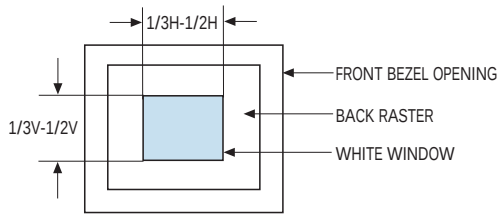

Figure 4-8. White Box Pattern

1. Use control bar after selecting “RED GAIN”, “GREEN GAIN” and “BLUE GAIN” to adjust the luminance to 40 ft-L with the color coordinates ranged for
9300K to x = 0.283 ± 0.02, y = 0.298 ± 0.02.

4-3-2 (c) ABL ADJUSTMENT

CONDITIONS

Scanning frequency: 68 kHz/85 Hz
Display image: Full white pattern
Brightness: Maximum
Contrast: Maximum

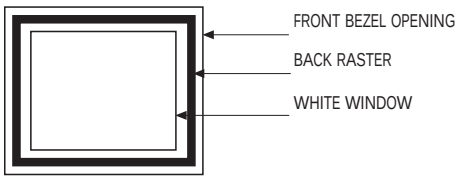

Figure 4-9. Full White Pattern

1. Check the ABL. If it is not within the specifications, use the ABL controls to adjust it. (29 ± 1 ft-L)
2. Select **“@4: COLOR SAVE”** to save the data.
3. Select **“@6: ALL COLOR SAVE”** to save the CH2.

4-3-2 (d) WHITE BALANCE ADJUSTMENT VERIFICATION

CONDITIONS

Scanning frequency:	68 kHz / 85 Hz
Display image:	Back raster pattern Full White Pattern
X-Y Coordinates:	x = 0.283 ± 0.02, y = 0.298 ± 0.02
ABL Luminance	Refer to 4-3-2(c)
Brightness:	Maximum
Contrast:	5 ft-L, 24 ft-L

1. Check whether the color coordinates of the back raster satisfy the above spec.

   If they do not, return to 4-3-2 (a) and readjust all settings.
2. Display a full white pattern.
3. Select “Geometry” in softjig menu.
4. Select “@7: 5-ft “ in right menu.
5. Check whether the white coordinates of the video meet the above coordinates spec.
6. Select “@8: 24-ft “ in right menu.
7. Check whether the white coordinates of the video satisfies the above spec.

   If they do not, return to 4-3-2 (a) and readjust all settings.

   Select “Color” and click “@2: CHANNEL 2” for color ajdustment for 6500K
   Repeat the sequence of 9300K adjustment.
   The luminance values the same as 9300K, but the color coordinated of back raster and white box are : x = 0.313 ± 0.02 y = 0.329 ± 0.02

4-3-3 Luminance Uniformity Check

Luminance is considered uniform only if the ratio of lowest to highest brightness areas on the screen is not less than 7.5:10.

CONDITIONS

Scanning frequency:	68 kHz / 85 Hz (1024 x 768)
Display image:	White flat field
Brightness:	Cut off point at 24 ft-L
Contrast:	Maximum

PROCEDURE

Measure luminance at nine points on the display screen (see figure below).

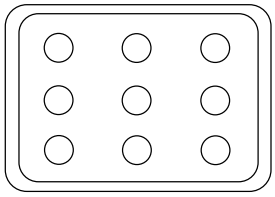

Figure 4-10. Luminance Uniformity Check Locations

4-3-4 Focus Adjustment

CONDITIONS

Scanning frequency:	68 kHz / 85 Hz (1024 x 768)
Display image:	“H” character pattern
Brightness:	Cut off point
Contrast:	Maximum

PROCEDURE

1. Adjust the Focus VR on the FBT to display the sharpest image possible.
2. Use Locktite to seal the Focus VR in position.

4-3-5 Color Purity Adjustment

Color purity is the absence of undesired color. Conspicuous mislanding (unexpected color in a uniform field) within the display area shall not be visible at a distance of 50 cm from the CRT surface.

CONDITIONS

Orientation:	Monitor facing east
Scanning frequency:	68 kHz / 85 Hz
Display image:	White flat field
Luminance:	Cut off point at the center of the display area

Note: Color purity adjustments should only be attempted by qualified personnel.

PROCEDURE

For trained and experienced service technicians only.

Use the following procedure to correct minor color purity problems:

1. Make sure the display is not affected by external magnetic fields.
2. Make sure the spacing between the PCM assembly and the CRT stem is 29 mm ± 1 mm.
3. Display a green pattern over the entire display area.
4. Adjust the purity magnet rings on the PCM assembly to display a pure green pattern. (Optimum setting: x = 0.295 ± 0.015, y = 0.594 ± 0.015)
5. Repeat steps 4 and 5 using a red pattern and then again, using a blue pattern.

Table 4-4. Color Purity Tolerances

Red:	x = 0.640 ± 0.015	y = 0.323 ± 0.015
Green:	x = 0.295 ± 0.015	y = 0.594 ± 0.015
Blue:	x = 0.142 ± 0.015	y = 0.066 ± 0.015

(For 9300K color adjustment: x = 0.283 ± 0.02, y = 0.298 ± 0.02)

6. When you have the PCMs properly adjusted, carefully glue them together to prevent their movement during shipping.